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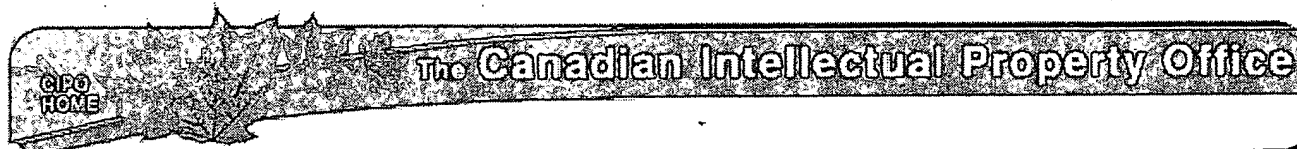
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(12) **Patent:**

(11) CA 802858

(54) DEVICE AND METHOD FOR DETERMINING PH OF THE STOMACH

(54)

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ABSTRACT:

CLAIMS: [Show all claims](#)

\*\*\* Note: Data on abstracts and claims is shown in the official language in which it was submitted.

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DEVICE AND METHOD FOR  
DETERMINING pH OF THE STOMACH

This invention relates to a diagnostic device and, more particularly, to means for measuring gastric acidity.

Determination of the acidity of the stomach is very important in diagnosing many physiological conditions. For instance, individuals with cancer of the stomach have a high instance of gastric achlorhydria, that is, absence of acid. All individuals with pernicious anemia exhibit gastric achlorhydria. Most patients with duodenal ulcers have an increased gastric acidity.

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Previously available methods of measuring the acidity of the stomach have been, for one reason or another, unsatisfactory. A standard method of measuring gastric acidity is by insertion of a hollow, flexible tube through the nose into the stomach and withdrawing some of the gastric contents by aspiration. This particular method is very uncomfortable for the patient and could result in damage to the esophagus or stomach. Other tests have been devised in an attempt to measure gastric acidity without intubation. When methods other than gastric intubation are used, considerable time and/or expense is involved in the test procedure. Some of these tests depend upon the ingestion of substances which react with the hydrochloric acid of the stomach and the resultant excretion of substances in the urine which can be measured colorimetrically. In one test a radio transmitter is swallowed which is activated by the acid content of the stomach. The signal is picked up by a receiver placed on the abdomen of the patient. Various other tests have been described in the literature.

The diagnostic device of the present invention is characterized by its extreme simplicity, low cost, accuracy,



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and speed with which it can be used and the results made known to the diagnostician. The use of the diagnostic device of the present invention causes little or no discomfort to the patient and the test can be repeated within a few minutes to confirm the results first obtained if desired.

Preferably, the present invention comprises a small capsule such as the conventional two-piece hard shell gelatin capsule with a string which has been impregnated with an acid-base indicator coiled therein, one end of which protrudes from a hole in one end of the capsule. The other end of the string is impinged between the overlapping parts of the capsule. Hard-shell gelatin pharmaceutical capsules are described on pages 389-392 of Remington's Practice of Pharmacy, 1956, and the disclosure thereof is incorporated herein by reference. To conduct the test, the patient holds one end of the protruding string, places the capsule in his mouth, and swallows it, with the aid of water if desired. The string unwinds as the capsule passes down the esophagus into the stomach. The capsule immediately softens and the string can be pulled loose from it and out of the stomach. The string is then examined for any color change which has resulted because of the action on the indicator of the string by the contents of the stomach.

A preferred embodiment of the present invention and the manner of its use will be more apparent by reference to the drawings in which:

Figure 1 is a plan view of the device of the present invention; and

Figure 2 is a perspective, partly in cross section, of the device of the present invention; and

Figure 3 is a view diagrammatically illustrating the use of the device of the present invention; and

Figure 4 is an enlarged partial cross section of the capsule showing the string impinged between the overlapping halves

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of the capsule.

Referring to Figures 1, 2, and 4, it will be seen that the diagnostic device comprises a two-piece capsule 10 having a thread, or string, 11 protruding through an aperture 12 at one end of the capsule. Preferably, the capsule is a conventional two-piece hard-shell gelatin capsule of the type widely used in the pharmaceutical industry and comprising overlapping halves 14 and 20. Gelatin is preferred because it quickly disintegrates in the stomach and thus frees the string which is coiled or folded up within as shown in Figure 2 so that it can make contact with the contents of the stomach. Capsules of other materials can, of course, be used but it is preferred that the inexpensive, readily available, gelatin capsules be employed. The string may be of any suitable absorbent, inert material such as No. 40 white cotton thread of about 70 centimeters in length. Obviously, strings of other materials of different sizes and different lengths may be employed. The only requirement is that the string be long enough to extend from the stomach to a few inches outside the mouth. As can be seen in Figure 4, one end of the string is impinged between overlapping halves 20 and 14 of the capsule 10.

All or part of the thread may be impregnated with a solution of an indicator such as, for example, a 1 per cent solution of Congo Red. If the contents of the stomach are at a pH of 3.0 or lower, the thread will turn to a very dark blue or almost black color. At a hydrogen ion concentration of 3.5, the string will turn to a purple color and at a pH of 4.0 or above, it will be red. Of course, other indicators such as Thymol Blue, Methyl Yellow, Methyl Orange, Bromophenyl Blue, Bromocresol Green, Bromothymol Blue, Phenol Red, and others may be used for various pH ranges that may be encountered. Wide spectrum acid-base indicators may also be used for preliminary examination in which case a different diagnostic capsule would be subsequently swallowed to determine the pH more accurately in the range indicated by the wide spectrum

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indicator. Another variation involves impregnating the string with fixed indicators which, when once affected by the stomach acid, retain their color change despite subsequent contact with body fluids having a different pH than that of the stomach. Another modification of the present invention involves treating short sections, i.e., about two inches, of one end of the string with several different indicators effective at different pH levels.

As will be apparent from Figure 3, the diagnostic  
10 device of the present invention may be used by the patient by simply grasping the free end of the thread 11 and placing the capsule in his mouth and swallowing it. The string should be allowed to remain in the stomach for at least a minute and preferably a little longer to allow the gelatin to disintegrate. The thread is then removed by the patient or by his nurse or physician by simply pulling it out of his mouth and the lower end of the string is examined to determine the color to which it has changed. This should be done promptly to avoid  
20 change of color by the impregnated string as it comes in contact with saliva of the mouth.

The device of the present invention can be administered without the sensation of gagging. The test can be performed without prior preparation and the results determined quickly. If an unsatisfactory result is obtained, the test can be repeated immediately thereafter. The diagnostic device may be used with individual patients or with groups. There is no danger of injury to the patient as would be the case when inserting a tube or other mechanical device.

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The embodiments of the invention in which an exclusive property or privilege is claimed are defined as follows:

1. A device for orally admitting a line in the alimentary canal which comprises:

(a) a hollow capsule having an opening therein, said capsule having a size and shape suitable for swallowing;

(b) a line coiled within said capsule and normally contained therein by the capsule walls; and

(c) one end of said line extending outwardly of said capsule through the capsule opening.

2. A device of claim 1 wherein the capsule is a pharmaceutical capsule.

3. A device of claim 1 wherein the line is a string impregnated with a pH color indicator.

4. A device for orally admitting a line in the alimentary canal which comprises:

(a) a pharmaceutical capsule having a narrow opening therein;

(b) a lined coiled within said capsule and normally contained therein by the capsule walls; and

(c) one end of said line extending outwardly of said narrow capsule opening.

5. A device for determining stomach acidity comprising:

(a) a cylindrical pharmaceutical capsule having an opening in one of the end walls thereof;

(b) a string coiled within said capsule and normally contained therein by the walls of said capsule, at least

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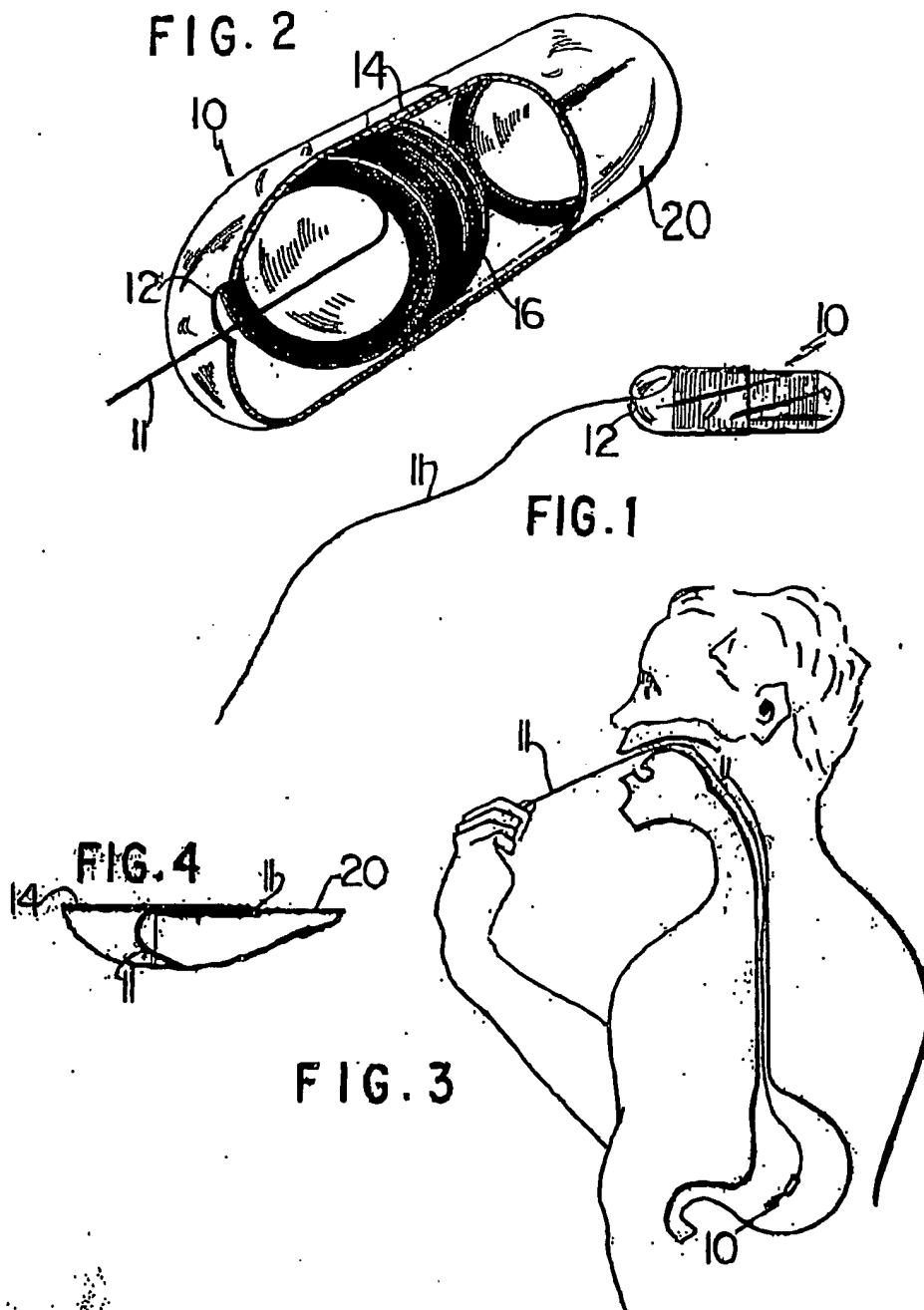
a portion of said string within said capsule impregnated with a pH indicator; and

(c) one end of said string extending outwardly of said capsule through the capsule opening.

6. A device of claim 5 wherein the pH indicator is Congo Red.







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